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EENY-045

White Grubs, *Phyllophaga* and Other Species[1]

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Introduction

True white grubs are the larvae of May beetles (also called June Beetles) found in the genus *Phyllophaga*, of which there are over 100 different species. *Phyllophaga* larvae and other larvae of the family Scarabaeidae are often referred to as "white grubs", including larvae of the Japanese beetle (*Popillia japonica* Newman), annual white grubs (*Cyclocephala* spp.), and the green June beetle (*Cotinis nitida* Linnaeus).

Figure 1. Adult Japanese beetle, *Popillia japonica* Newman. Credits: James Castner, University of Fl

Figure 2. Adult green June beetle, *Cotinis nitida* Linnaeus. Credits: John L. Capinera, University of Florida

Distribution

Phyllophaga spp. and related insects are distributed throughout the United States and Canada. However, the distribution of individual species usually is more restricted.

Description

Adult: May beetles are about 12 to 25 mm long. The adults often are yellow to dark reddish-brown to black, robust, oblong, shining beetles. Some, such as the green June beetle, are more brightly colored.

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Figure 3. Typical June beetle, adult of "white grub," of the genus *Phyllophaga.* Credits: James Castner, University of Fl

Larva: Length varies from 20 to 45 mm. Larvae are white with a C-shape body, brown head, and three pairs of legs. The hind portion of the abdomen is slightly enlarged and appears darker due to the soil particles showing through the body wall. Two parallel rows of spines seen on the underside of the last abdominal segment distinguish true white grubs from similar-looking larvae.

Figure 4. Typical white grub of the genus *Phyllophaga.* Credits: John L. Capinera, University of Florida

Pupa: Length varies from 20 to 24 mm long. The pupa is colored white, faint yellow, or dark brown.

Egg: Eggs are usually 1.5 to 3 mm in diameter and found encased in soil aggregates. They are small, spherical, pearly white eggs that darken just before hatching.

Life Cycle

The *Phyllophaga* life cycles vary somewhat because some species complete their growth in one year, while others require as much as four years. The common life cycle of the more destructive and abundant of these beetles extends over three years. The adults mate in the evening and, at dawn, females return to the ground to deposit 15 to 20 eggs, 1 to 8 inches deep in the soil. Since the adults are attracted to trees to feed, they tend to lay most eggs in the higher portions of sod near wooded areas. Eggs hatch about three weeks later into young larvae that feed upon roots and decaying vegetation throughout the summer and, in the autumn, they migrate downward (to a depth of up to 1.5 meters) and remain inactive until the following spring. At this point in the insect's life cycle the greatest amount of damage occurs as the larvae return near the soil surface to feed on the roots of the plants. The next autumn the larvae again migrate deep into the soil to overwinter, returning near the soil surface the following spring (the third spring) to feed on plant roots until they are fully grown in late spring. These grubs then form oval earthen cells and pupation follows. The adult beetles emerge from the pupal stage a few weeks later, but they do not leave the ground. The beetles overwinter, emerging the following year in May or June when feeding, mating, and egg-laying take place.

Management

Although white grubs can be a problem every year, the most serious damage occurs in regular three year cycles. The greatest damage to crops occurs the year after the appearance of the adults. During the years of heavy May beetle infestation, deep-rooted legumes, such as alfalfa or clovers, should be planted. If corn or small grains are present, every effort should be made to keep the field free of grass and weed growth, as this will reduce the number of eggs laid. The year following heavy flights of May beetles, planting corn or potatoes should be avoided in fields that were previously under sod or grass.

Late spring or early autumn plowing destroys many larvae, pupae, and adults in the soil and also exposes the insects to predators, such as birds and skunks. For this cultural practice to be effective, plowing must occur before the grubs migrate below the plow depth. No-tillage or reduced tillage crop management enhances grub populations.

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Natural enemies that control these white grubs include parasitic wasps and flies in the genera *Tiphia* and *Myzinum* (Hymenoptera: Tiphiidae), and *Pelecinus polyturator* Drury (Hymenoptera: Pelecinidae), and the fly, *Pyrgota undata* (Diptera: Pyrgotidae). Also, *Cordyceps* fungus infects the grubs.

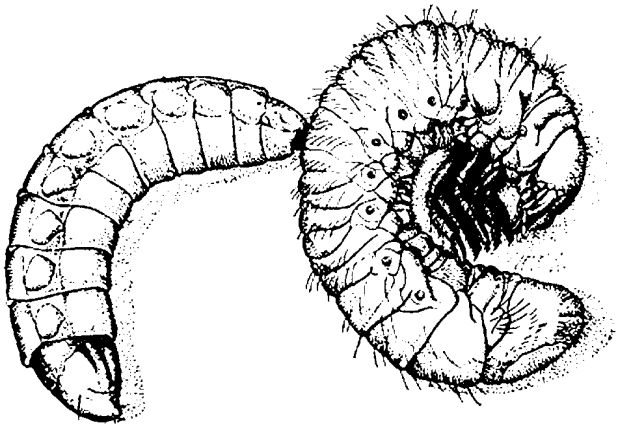

Figure 5. Parasitic wasp feeding externally on white grub.

Figure 6. Pelecinid wasp. Credits: Paul M. Choate, University of Florida

Inoculating the soil with the bacteria *Bacillus popilliae* Dutky and *B. lentimorbus* Dutky spores aids in reducing populations. This product is available commercially.

For insecticide recommendations for white grubs, see specific crop recommendations in the Florida Insect Management Guide.

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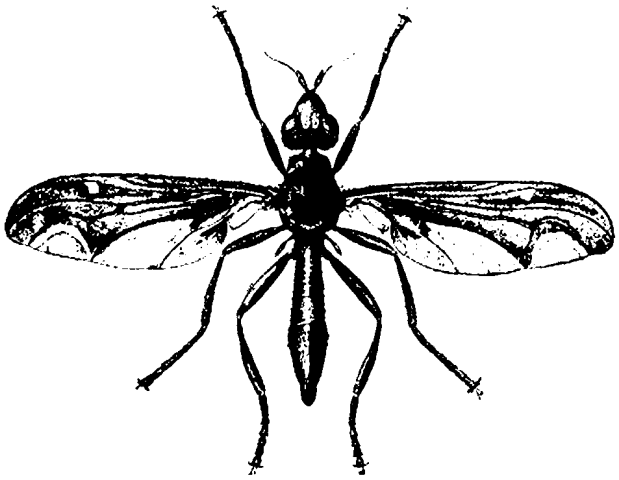

Figure 7. Pyrgotid fly. Credits:

Figure 8. White grub infected with *Cordyceps* fungus. Credits: Jim Kalisch, University of Nebraska - Lincoln (http://entomology.unl.edu/)

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